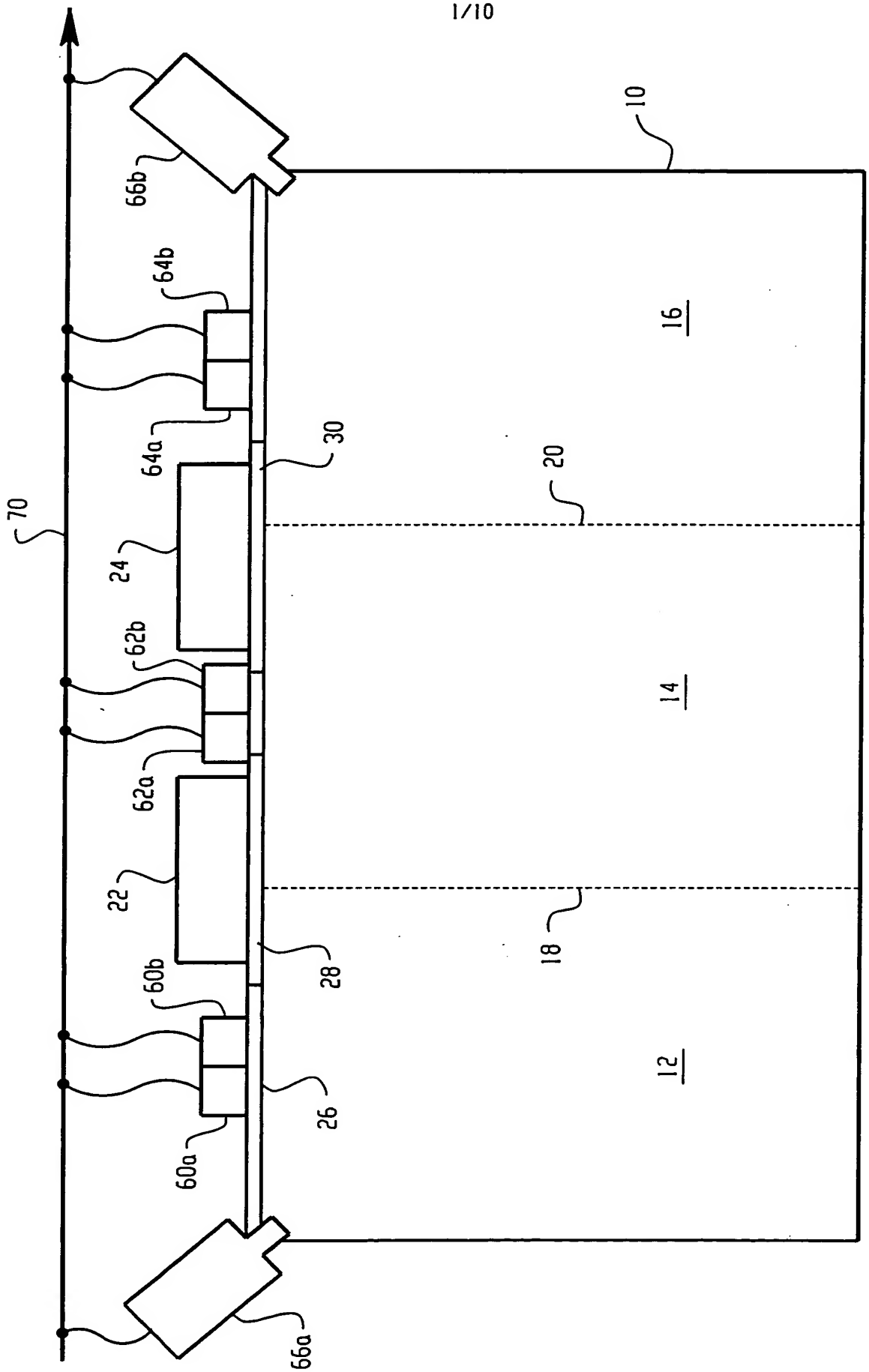

Fig. 1

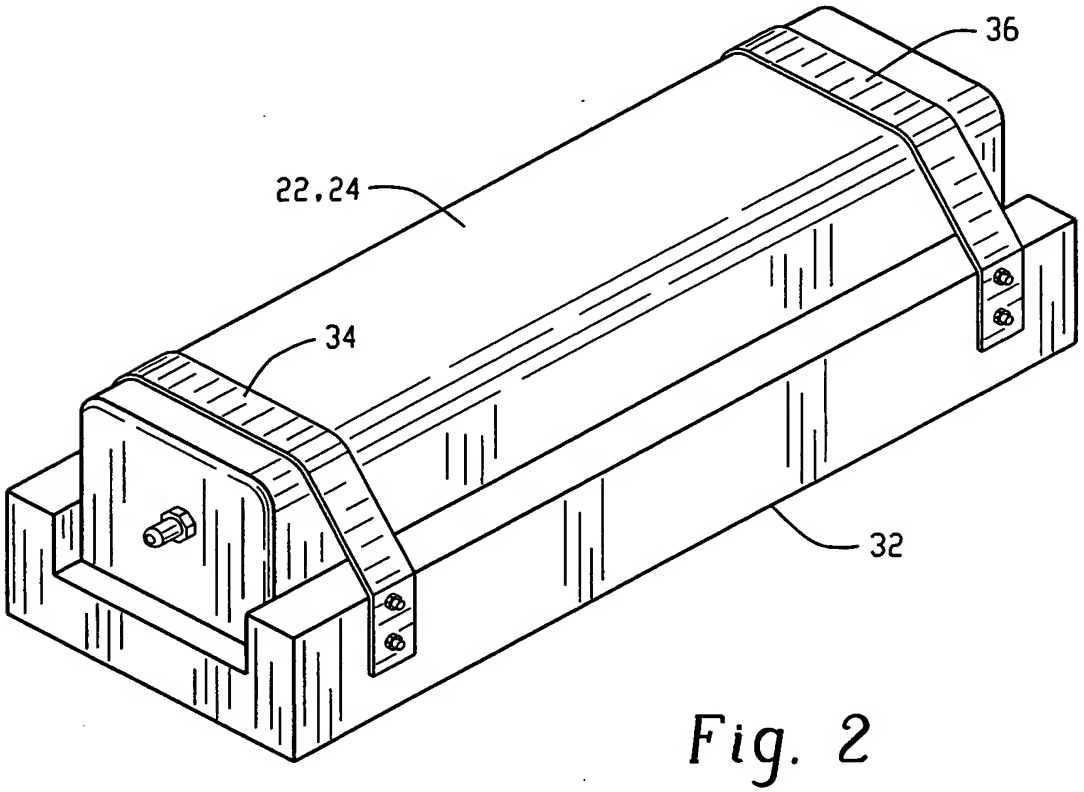

Fig. 2

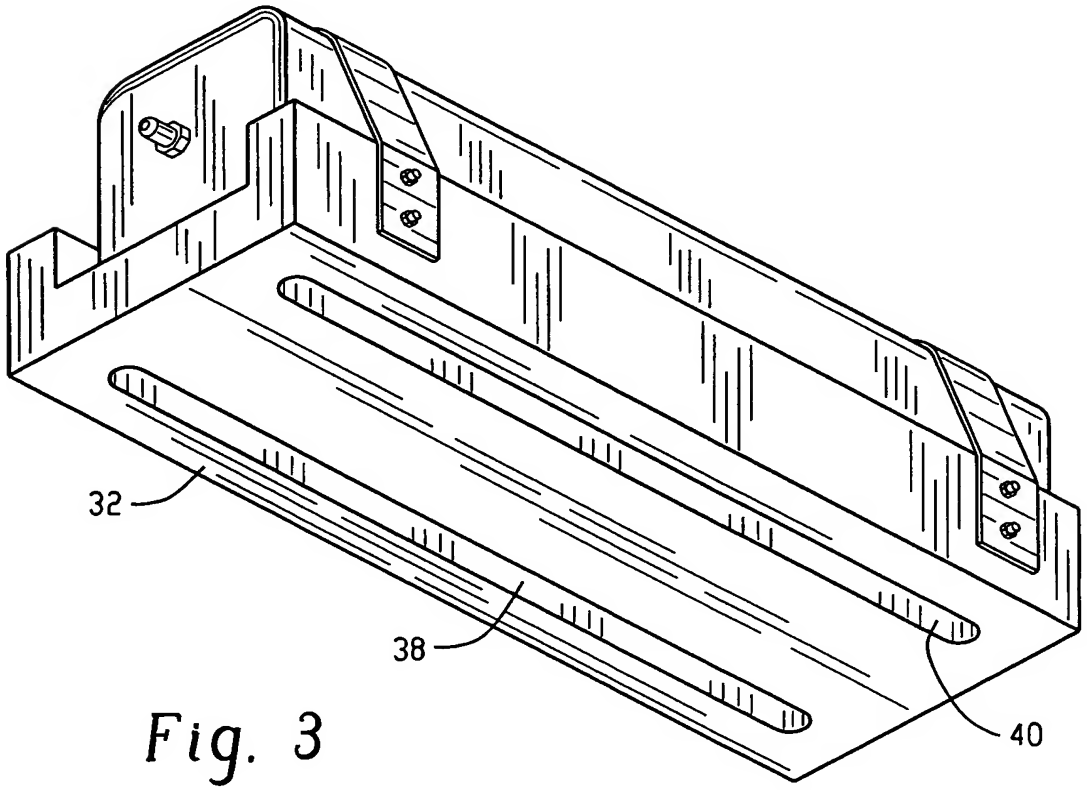

Fig. 3

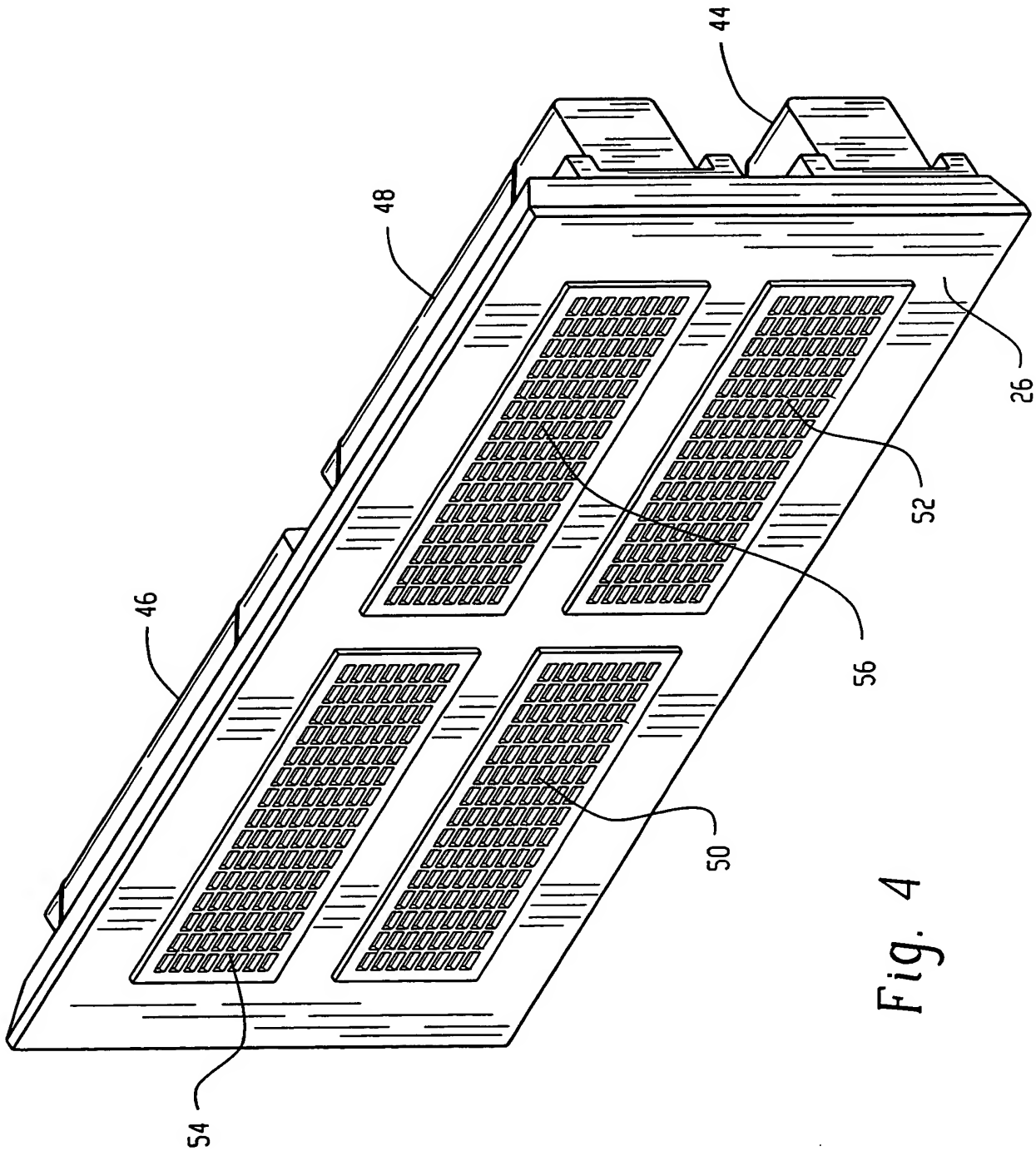

Fig. 4

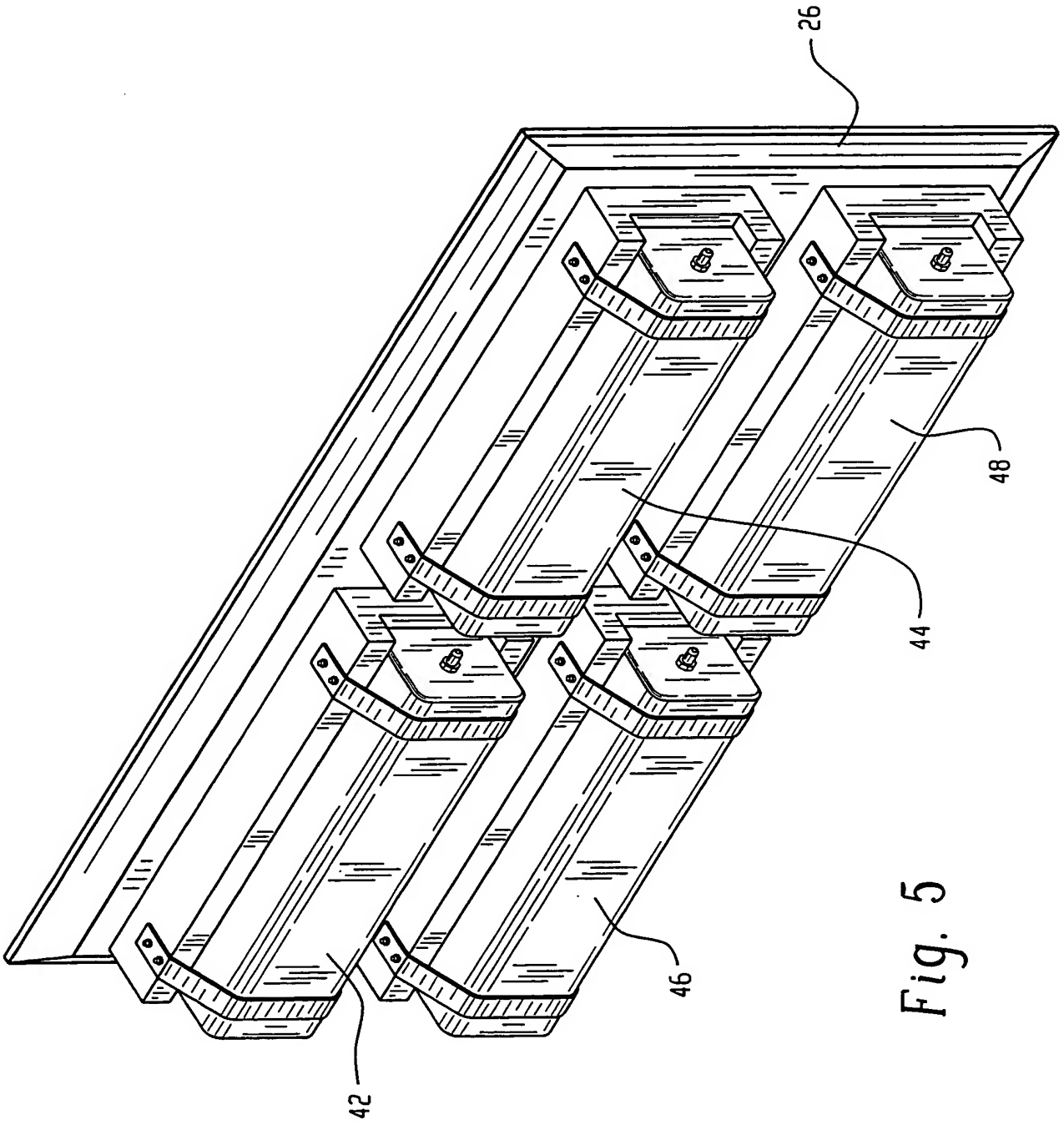

Fig. 5

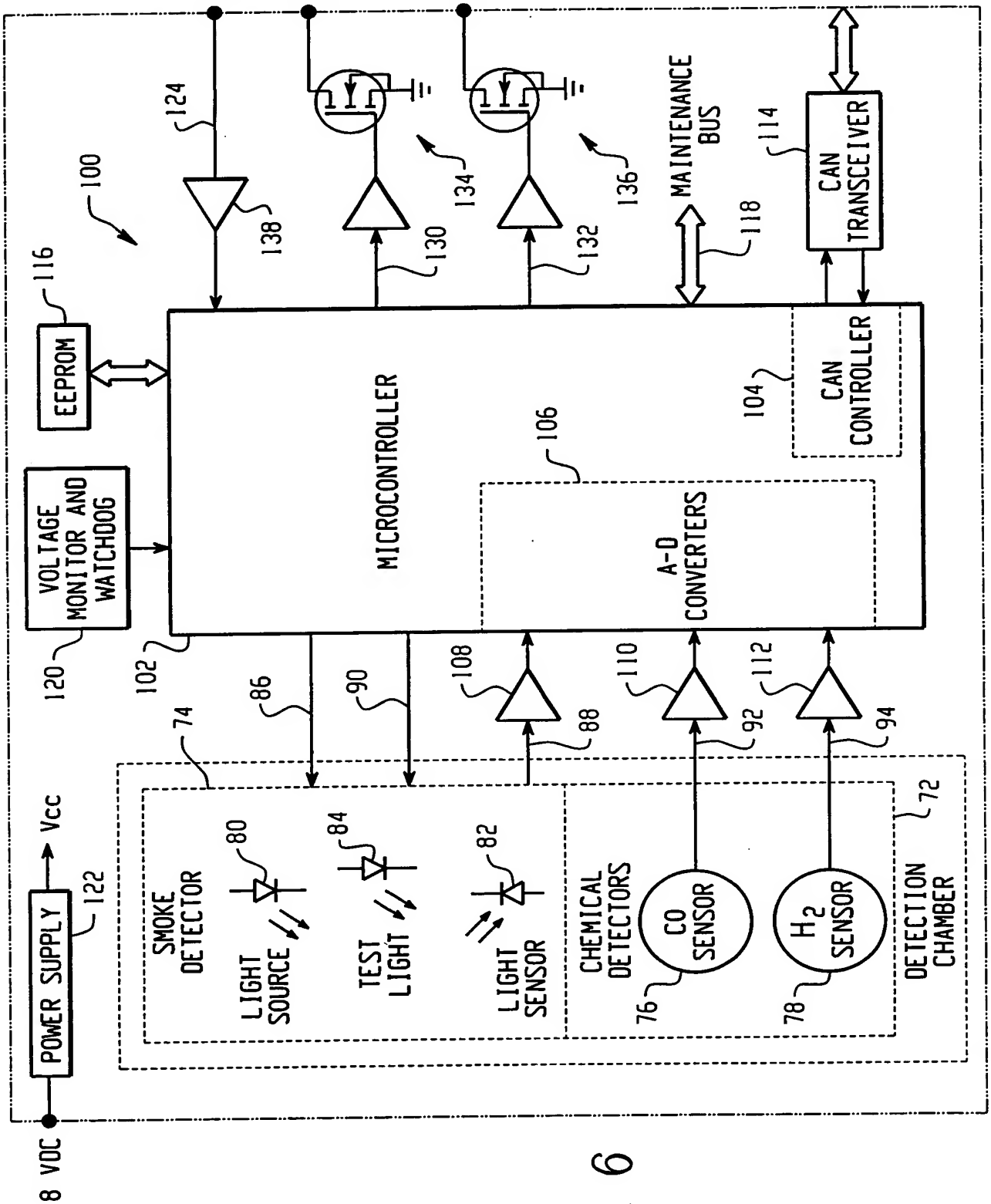
TEST INPUT
ALARM OUTPUT
FAULT OUTPUT
CAN BUS
MAINTENANCE BUS
CAN TRANSCEIVER
CAN CONTROLLER
EEPROM
MICROCONTROLLER
A-D CONVERTERS
VOLTAGE MONITOR AND WATCHDOG
POWER SUPPLY
Vcc
8 VDC
SMOKE DETECTOR
LIGHT SOURCE
TEST LIGHT
LIGHT SENSOR
CHEMICAL DETECTORS
CO SENSOR
H_2 SENSOR
DETECTION CHAMBER
100
102
104
106
108
110
112
114
116
118
120
122
124
130
132
134
136
138
74
72
76
78
80
82
84
86
88
90
92
94

Fig. 6

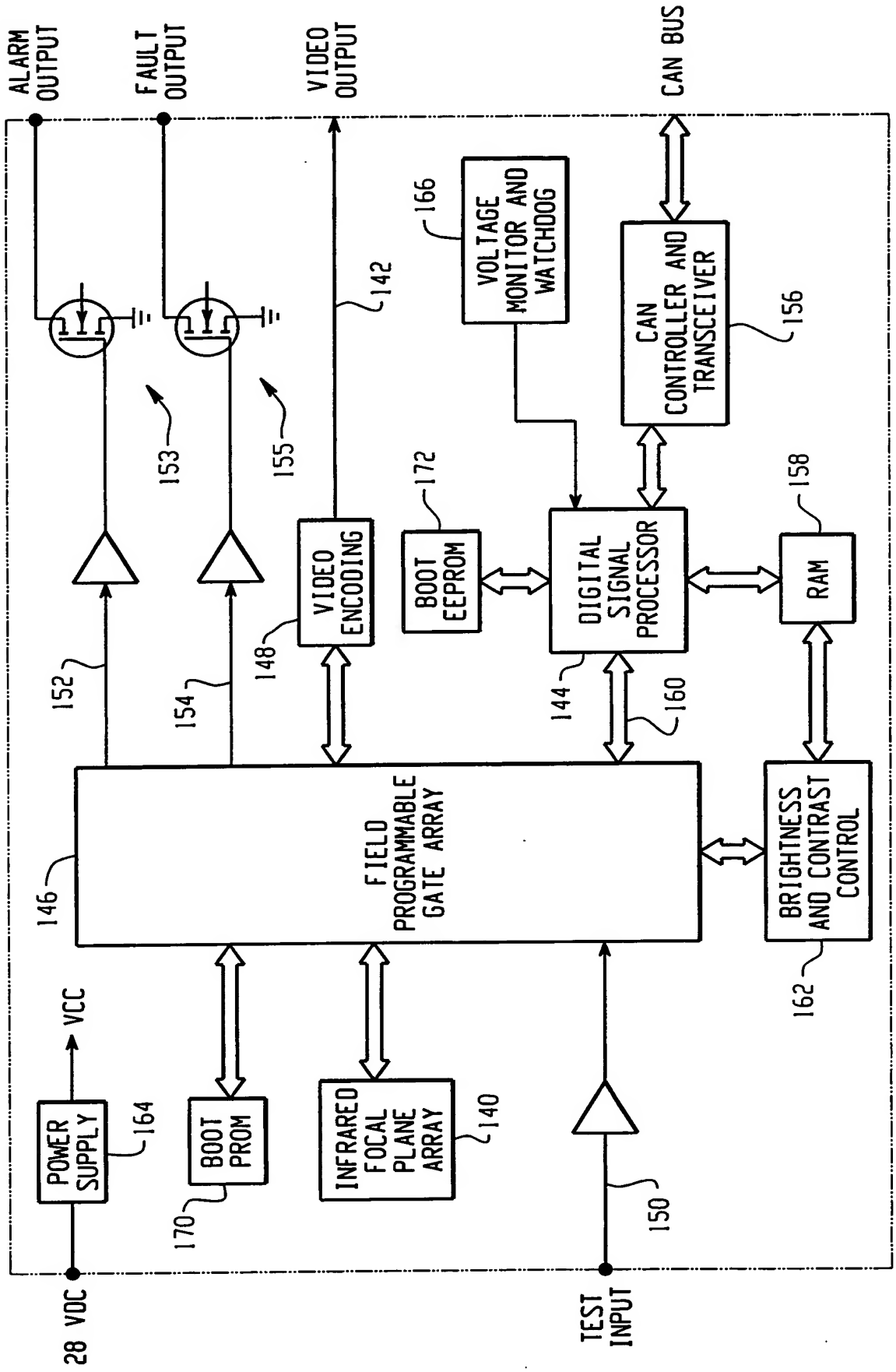
ALARM OUTPUT
FAULT OUTPUT
VIDEO OUTPUT
CAN BUS
VOLTAGE MONITOR AND WATCHDOG
166
CAN CONTROLLER AND TRANSCEIVER
156
142
153
155
172
158
VIDEO ENCODING
BOOT EEPROM
DIGITAL SIGNAL PROCESSOR
RAM
148
152
154
144
160
FIELD PROGRAMMABLE GATE ARRAY
146
BRIGHTNESS AND CONTRAST CONTROL
162
VCC
POWER SUPPLY
164
BOOT PROM
170
INFRARED FOCAL PLANE ARRAY
140
150
28 VDC
TEST INPUT

Fig. 7

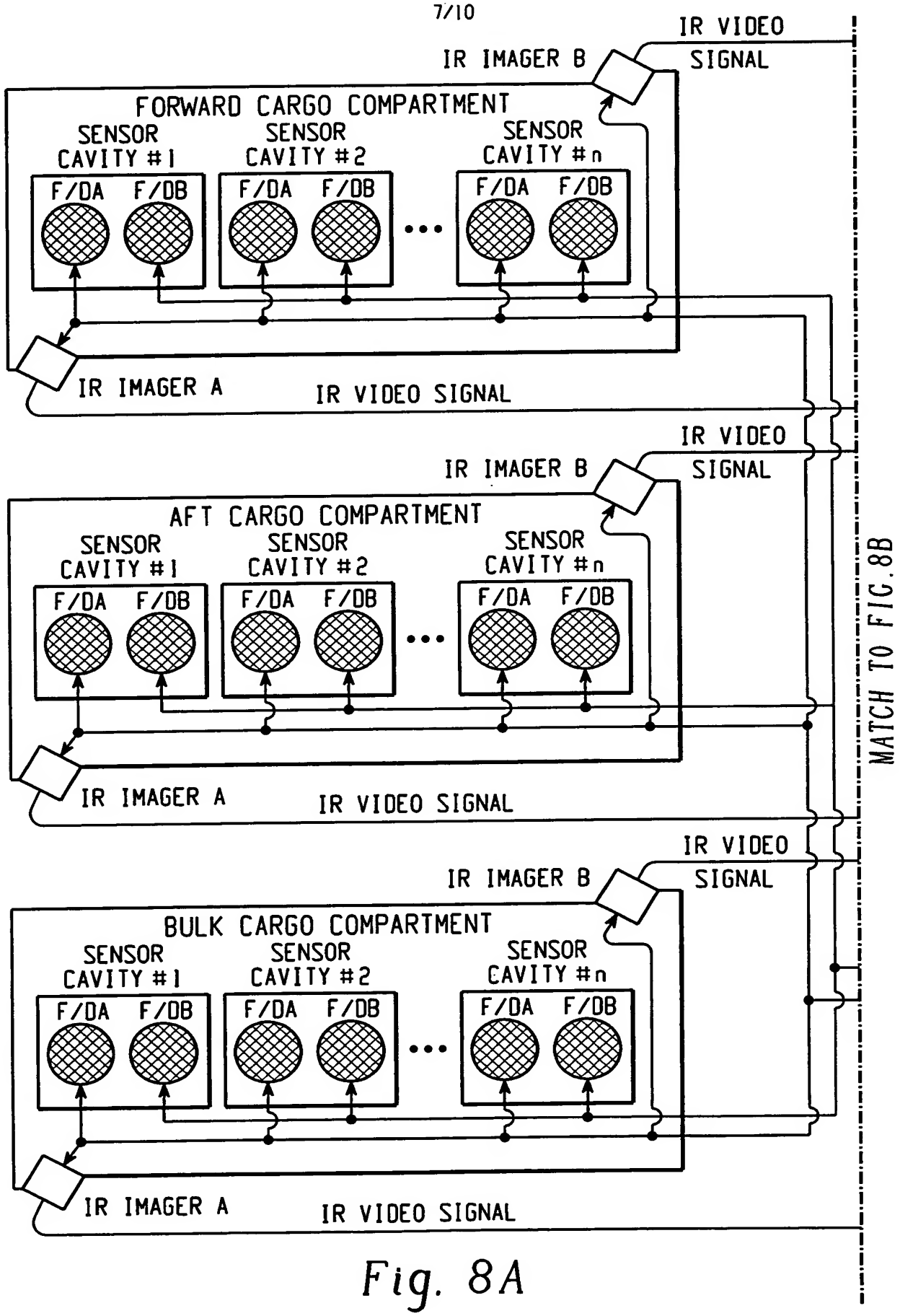
IR VIDEO SIGNAL
IR IMAGER B
FORWARD CARGO COMPARTMENT
SENSOR CAVITY #1
SENSOR CAVITY #2
SENSOR CAVITY #n
F/DA
F/DB
IR IMAGER A
IR VIDEO SIGNAL
AFT CARGO COMPARTMENT
BULK CARGO COMPARTMENT
MATCH TO FIG.8B

Fig. 8A

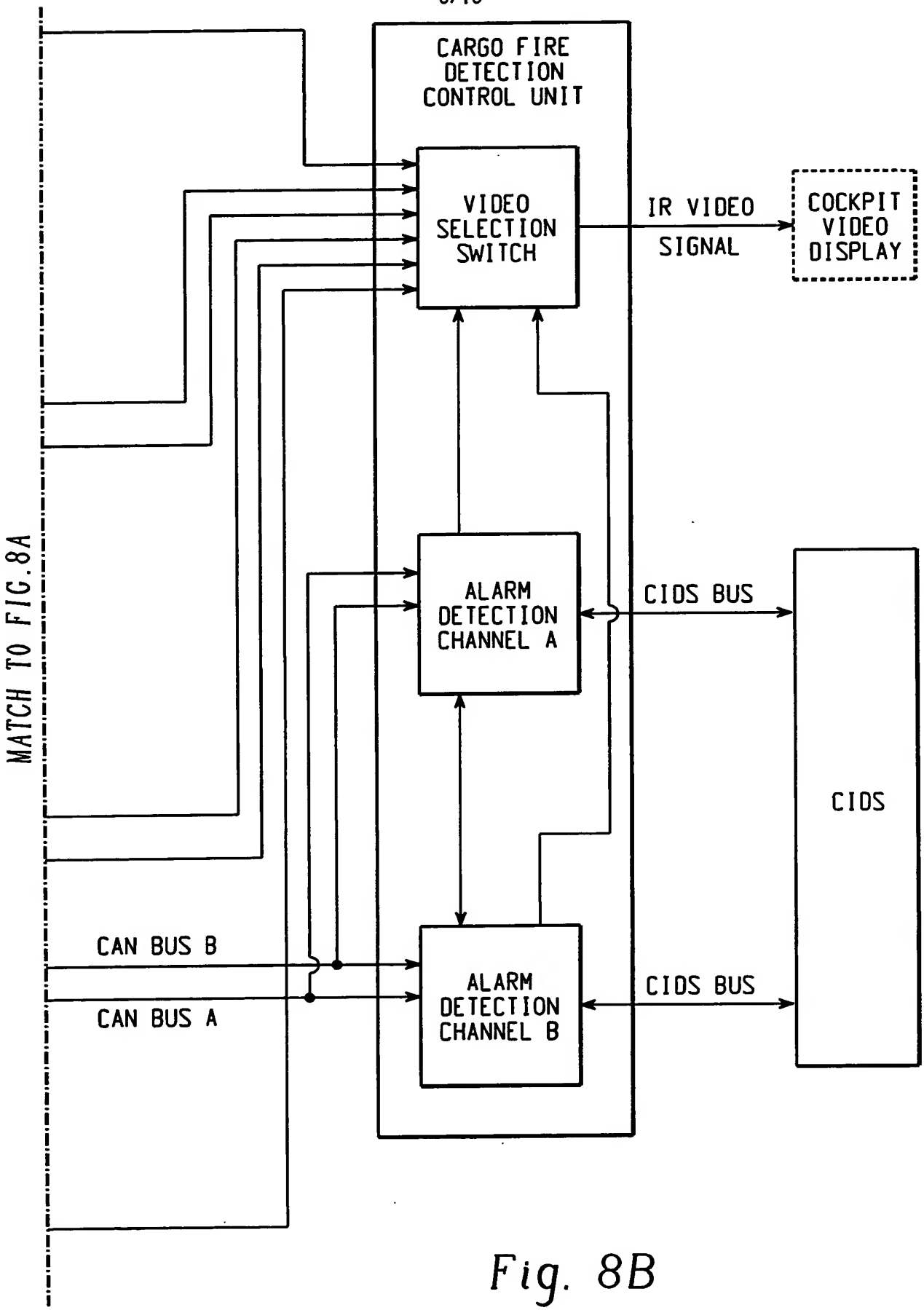
CARGO FIRE DETECTION CONTROL UNIT
VIDEO SELECTION SWITCH
IR VIDEO SIGNAL
COCKPIT VIDEO DISPLAY
ALARM DETECTION CHANNEL A
CIDS BUS
CIDS
CAN BUS B
CAN BUS A
ALARM DETECTION CHANNEL B
CIDS BUS
MATCH TO FIG.8A

Fig. 8B

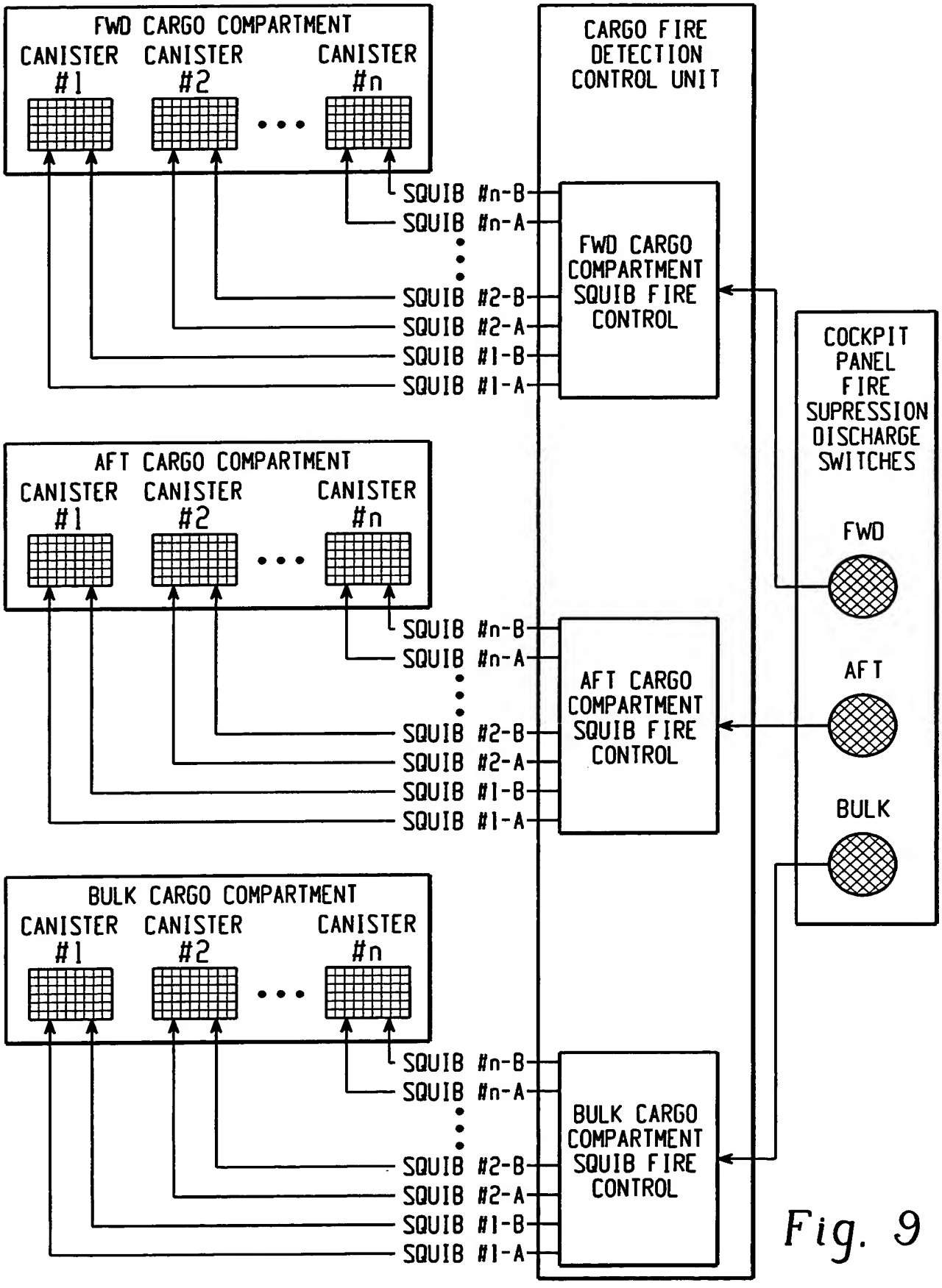
FWD CARGO COMPARTMENT
CANISTER #1
CANISTER #2
CANISTER #n
AFT CARGO COMPARTMENT
CANISTER #1
CANISTER #2
CANISTER #n
BULK CARGO COMPARTMENT
CANISTER #1
CANISTER #2
CANISTER #n
CARGO FIRE DETECTION CONTROL UNIT
SQUIB #n-B
SQUIB #n-A
SQUIB #2-B
SQUIB #2-A
SQUIB #1-B
SQUIB #1-A
FWD CARGO COMPARTMENT SQUIB FIRE CONTROL
AFT CARGO COMPARTMENT SQUIB FIRE CONTROL
BULK CARGO COMPARTMENT SQUIB FIRE CONTROL
COCKPIT PANEL FIRE SUPRESSION DISCHARGE SWITCHES
FWD
AFT
BULK

Fig. 9

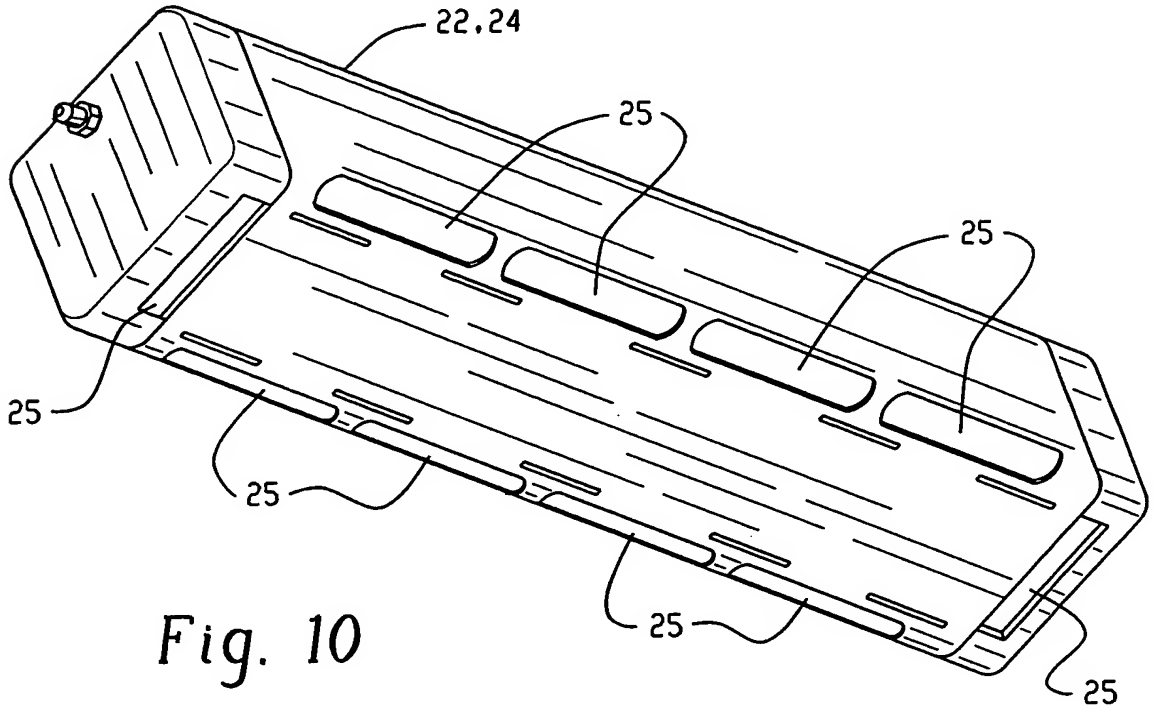

Fig. 10

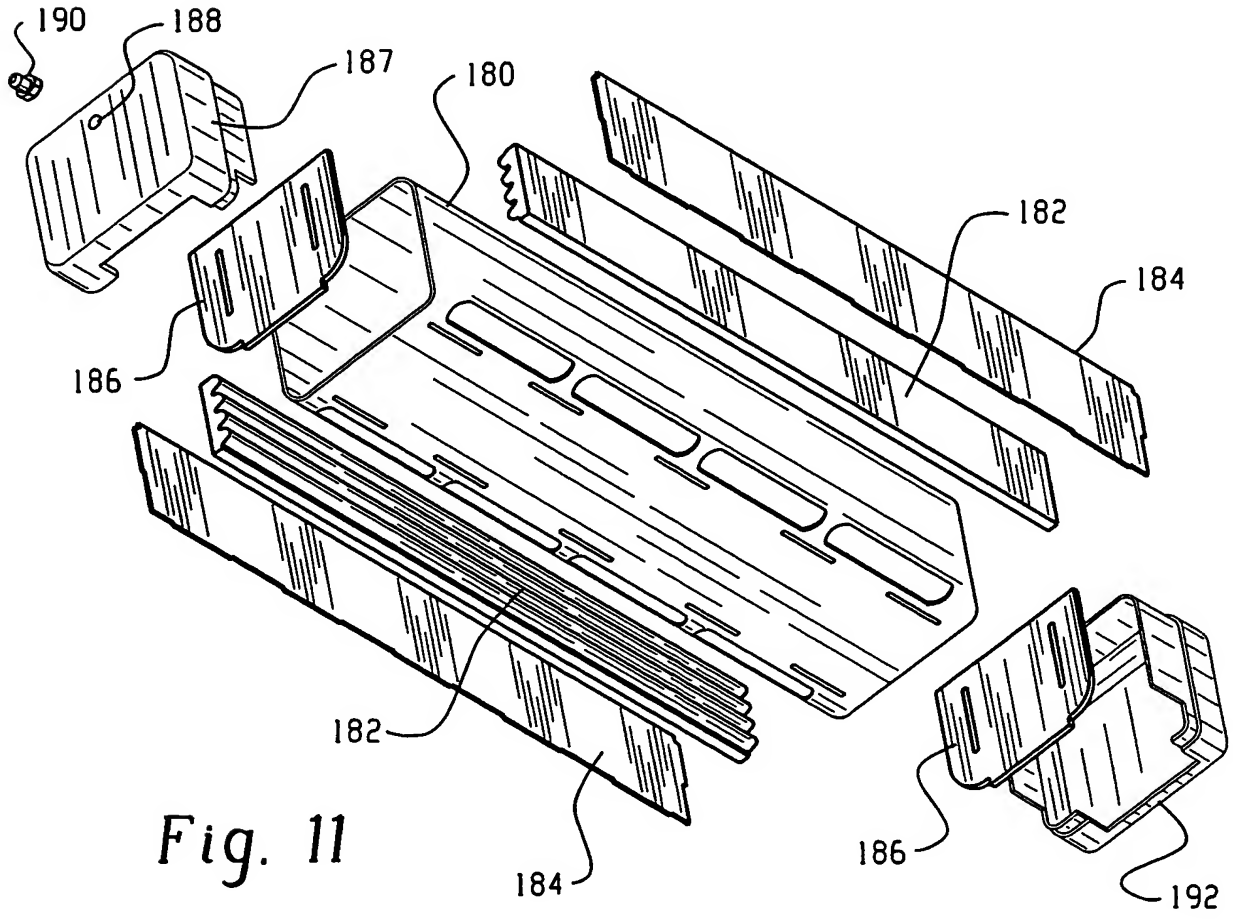

Fig. 11

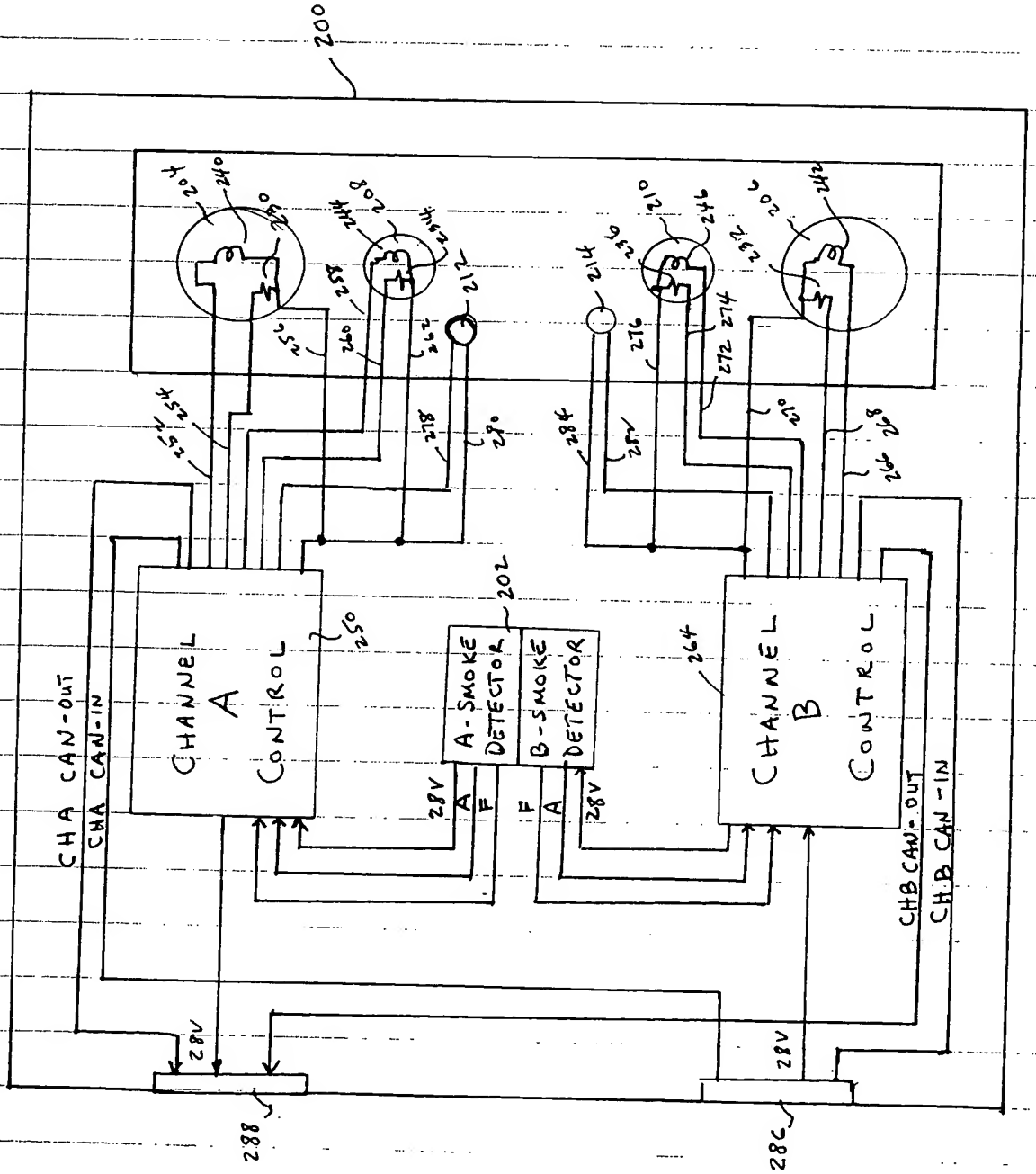
200
CHANNEL A CONTROL
250
A-SMOKE DETECTOR
B-SMOKE DETECTOR
202
CHANNEL B CONTROL
264
CHA CAN-OUT
CHA CAN-IN
CHB CAN-OUT
CHB CAN-IN
28V
A
F
F
A
28V
28V
28V
288
286

FIG. 12

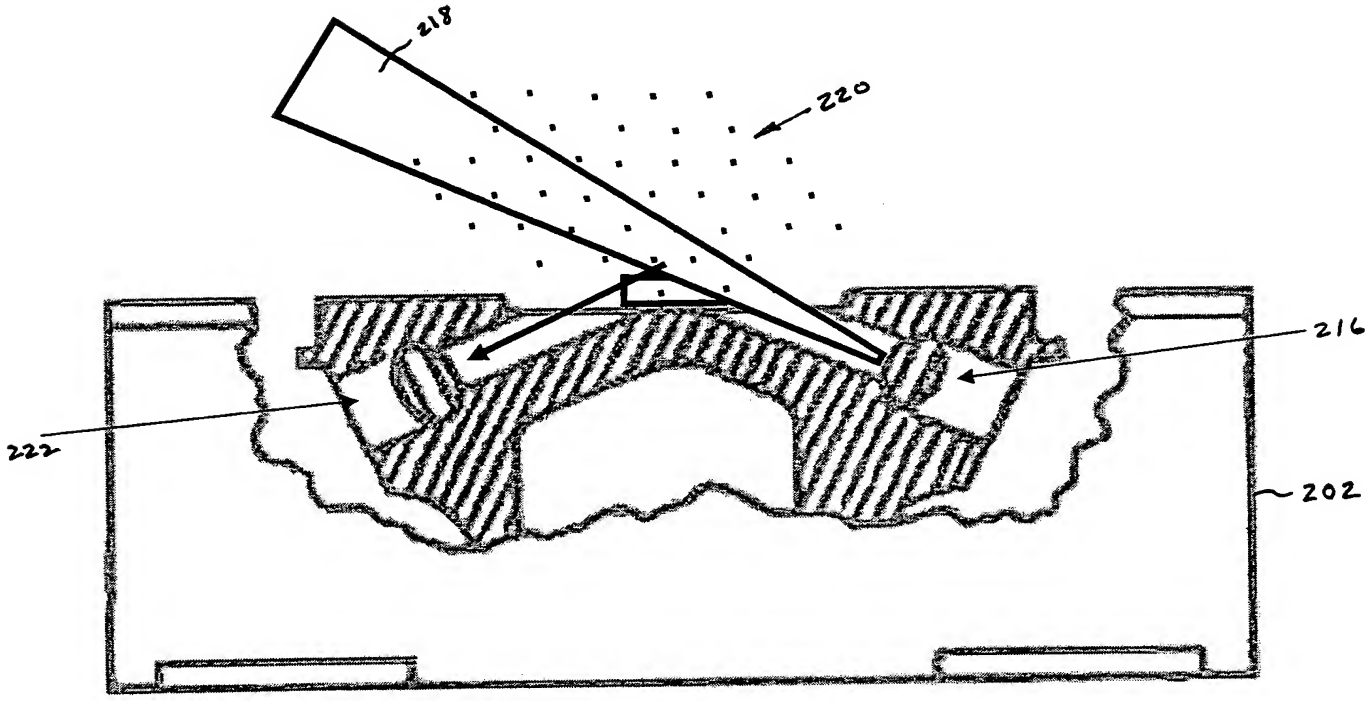

FIG. 13

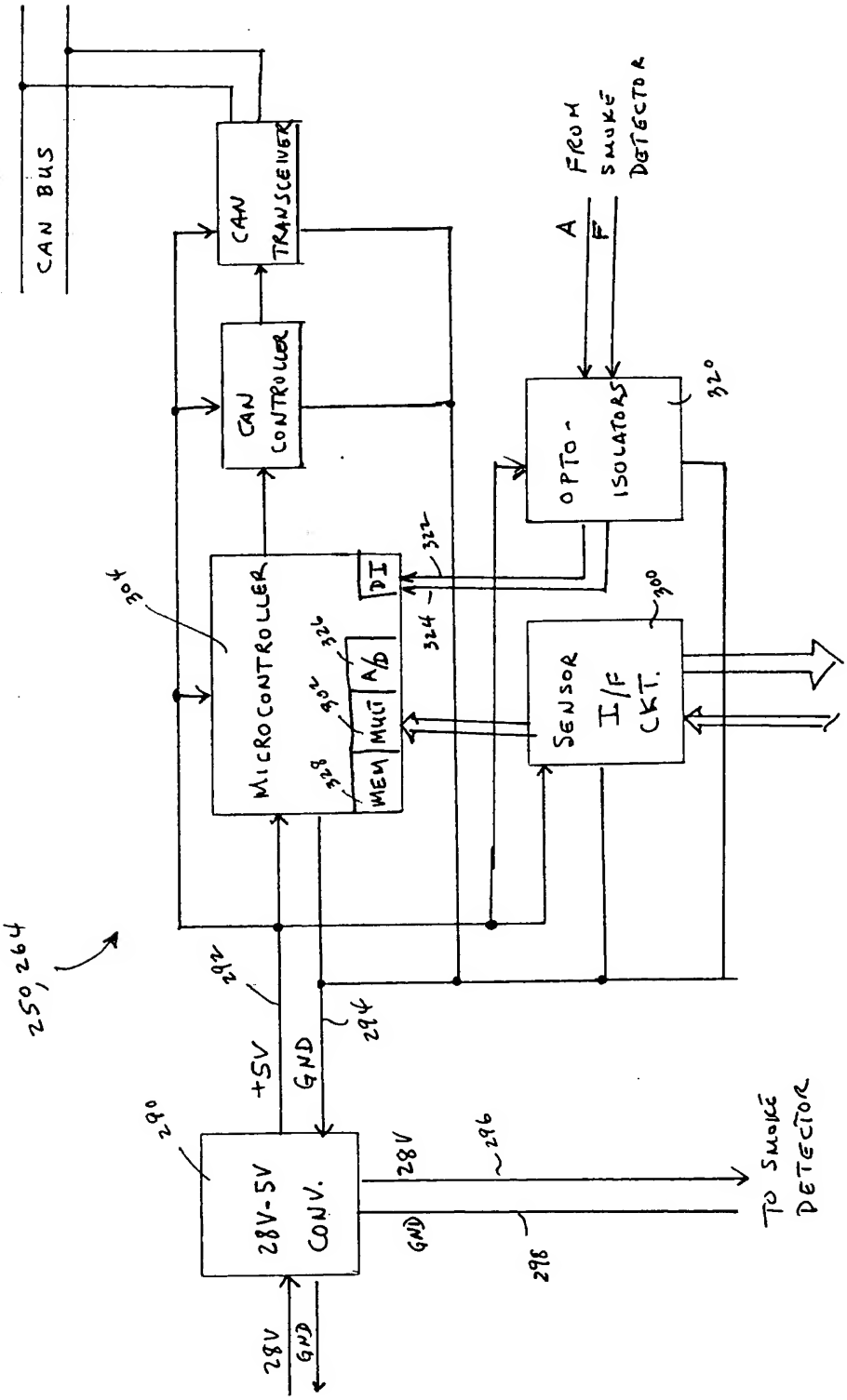
CAN BUS
CAN TRANSCEIVER
CAN CONTROLLER
MICROCONTROLLER
DI
A/D
MULT
MEM
OPTO-ISOLATORS
FROM SMOKE DETECTOR
A
F
SENSOR I/F CKT.
H_2 & CO & Temp. SENSORS
250, 264
+5V
GND
28V-5V CONV.
28V
GND
TO SMOKE DETECTOR
290
292
294
296
298
300
302
304
320
322
324
326
328

FIG. 14

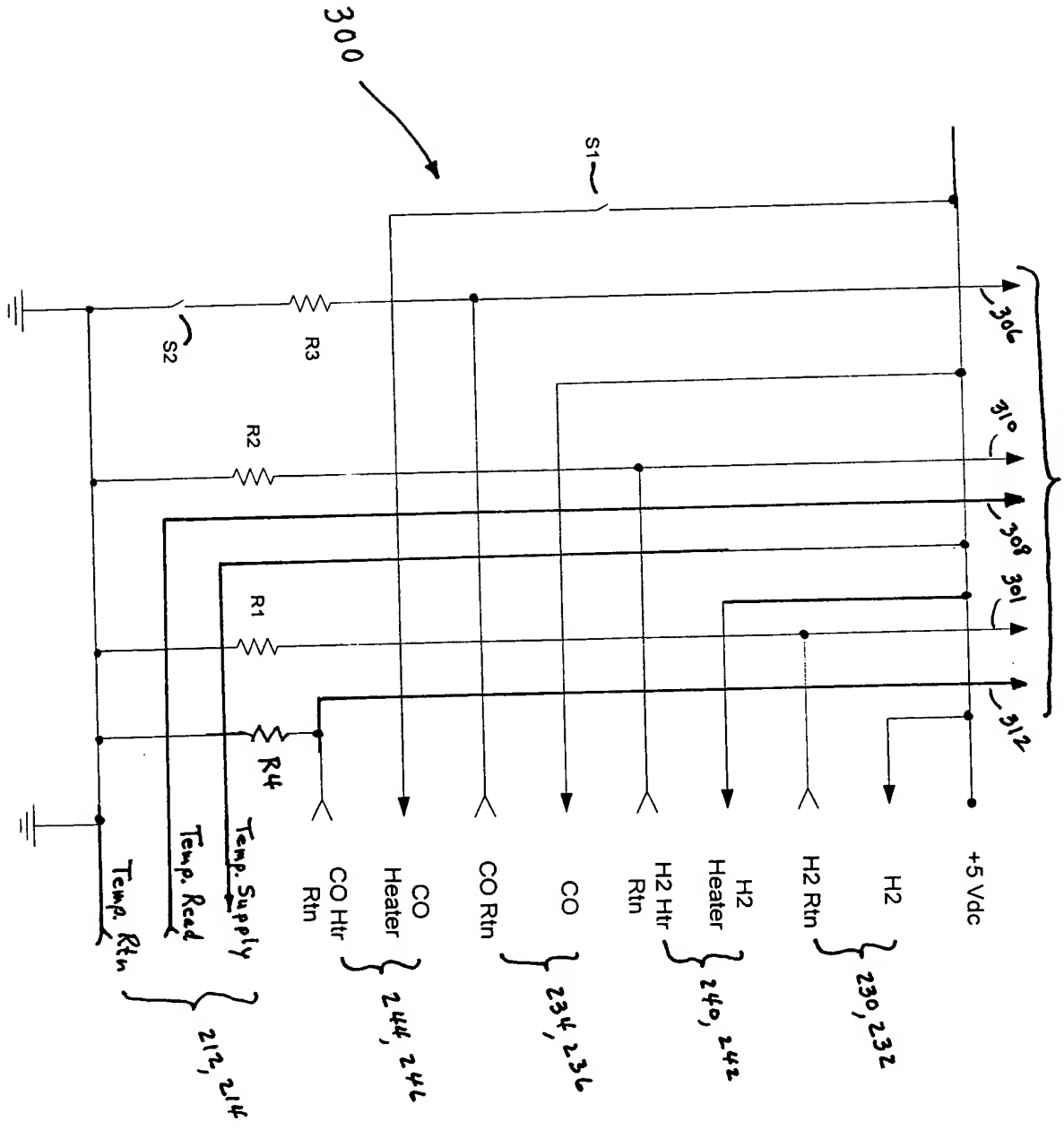
300
S1
S2
R1
R2
R3
R4
306
310
308
301
312
To Multiplexer 302
+5 Vdc
H2
H2 Rtn
230, 232
H2 Heater
H2 Htr Rtn
240, 242
CO
CO Rtn
234, 236
CO Heater
CO Htr Rtn
244, 246
Temp. Supply
Temp. Read
Temp. Rtn
212, 214

Figure 15A

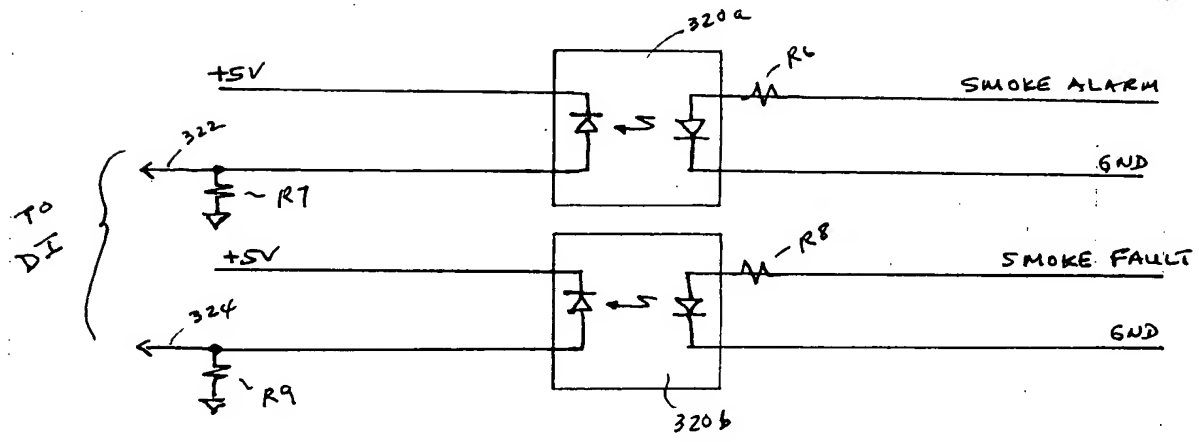
320a
+5V
R6
SMOKE ALARM
322
GND
TO DI
R7
+5V
R8
SMOKE FAULT
324
GND
R9
320b

FIG. 15B

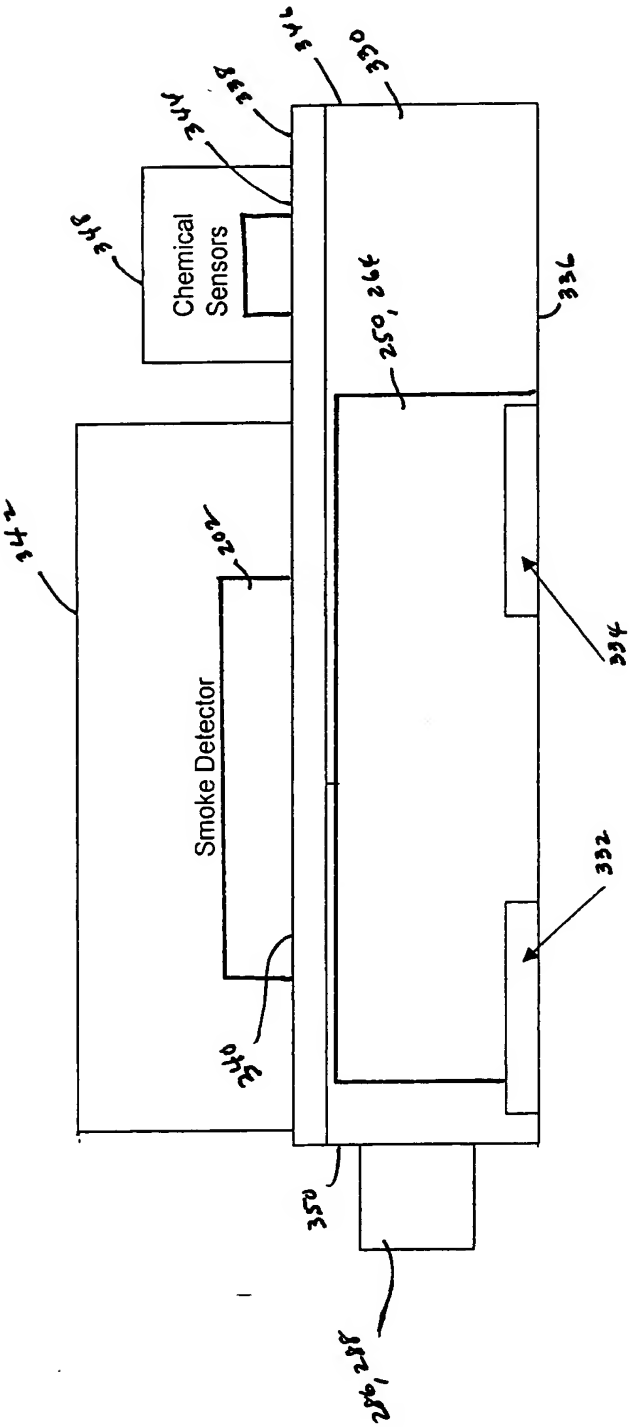

FIG. 16

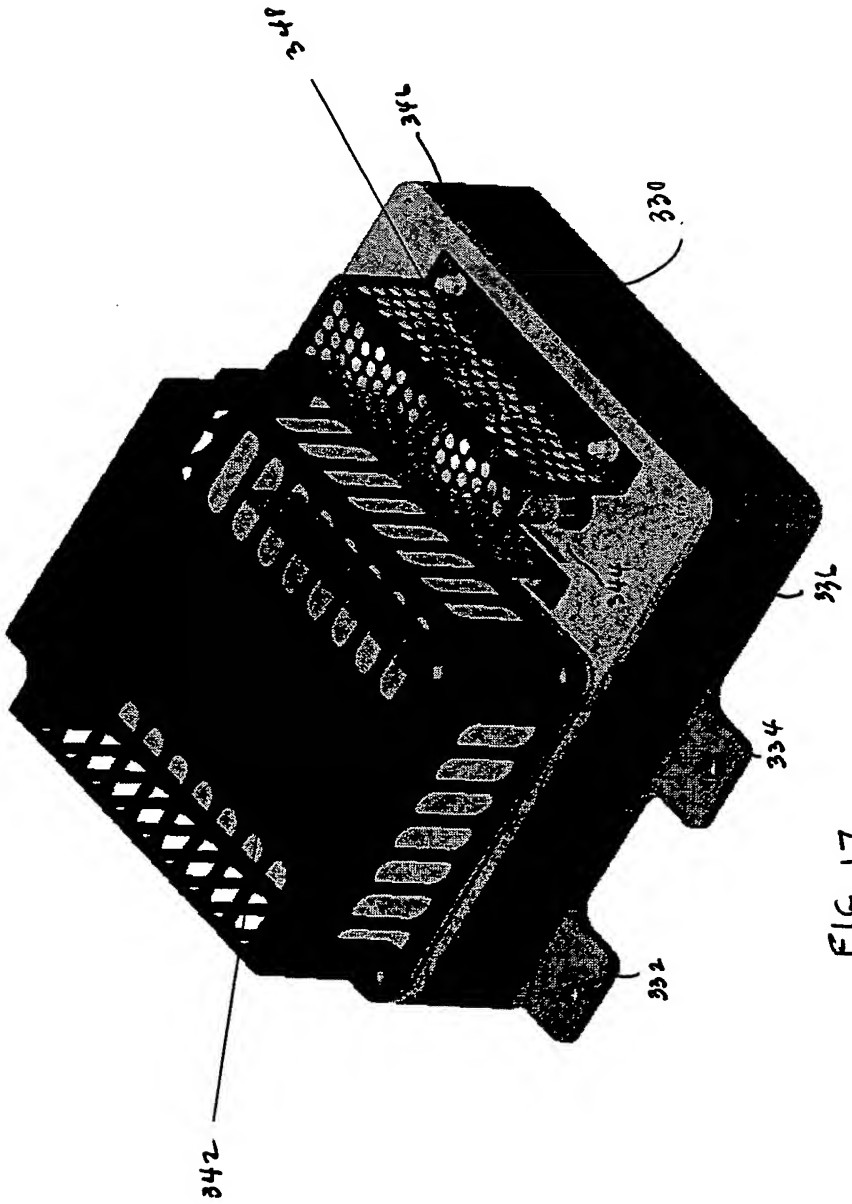

FIG. 17

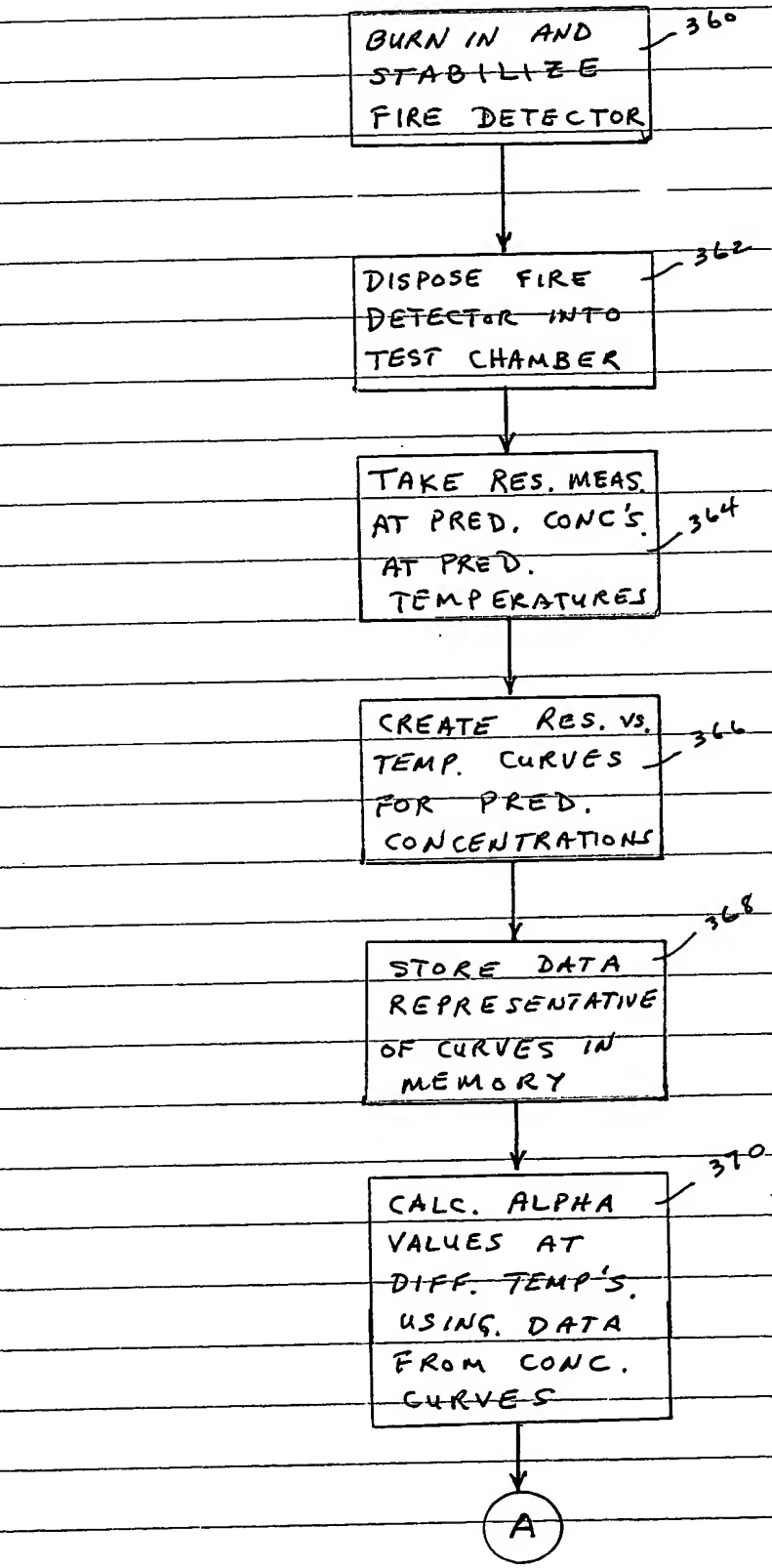
BURN IN AND STABILIZE FIRE DETECTOR
360
DISPOSE FIRE DETECTOR INTO TEST CHAMBER
362
TAKE RES. MEAS. AT PRED. CONC'S. AT PRED. TEMPERATURES
364
CREATE RES. VS. TEMP. CURVES FOR PRED. CONCENTRATIONS
366
STORE DATA REPRESENTATIVE OF CURVES IN MEMORY
368
CALC. ALPHA VALUES AT DIFF. TEMP'S. USING DATA FROM CONC. CURVES
370
A

FIG. 18A

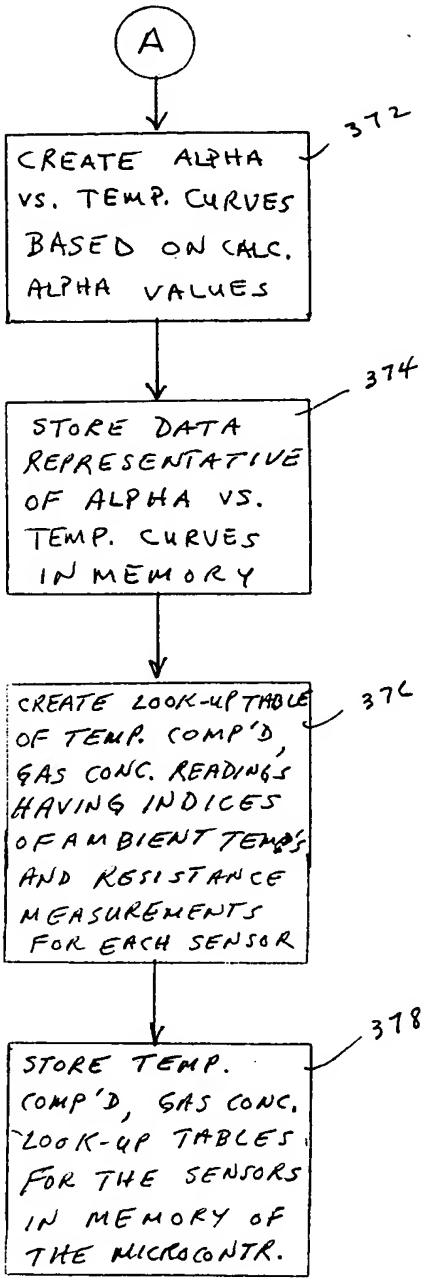
A
CREATE ALPHA VS. TEMP. CURVES BASED ON CALC. ALPHA VALUES
372
STORE DATA REPRESENTATIVE OF ALPHA VS. TEMP. CURVES IN MEMORY
374
CREATE LOOK-UP TABLE OF TEMP. COMP'D, GAS CONC. READINGS HAVING INDICES OF AMBIENT TEMPS AND RESISTANCE MEASUREMENTS FOR EACH SENSOR
376
STORE TEMP. COMP'D, GAS CONC. LOOK-UP TABLES FOR THE SENSORS IN MEMORY OF THE MICROCONTR.
378

FIG. 18B

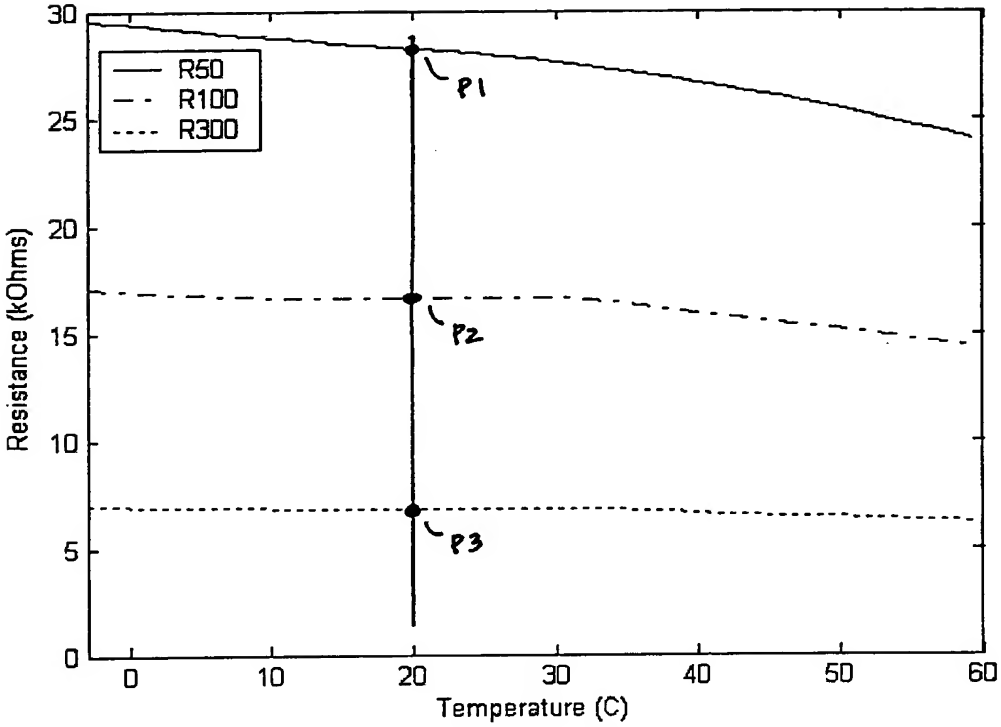
R50
R100
R300
P1
P2
P3
Resistance (kOhms)
Temperature (C)
0
5
10
15
20
25
30
0
10
20
30
40
50
60

FIG. 19

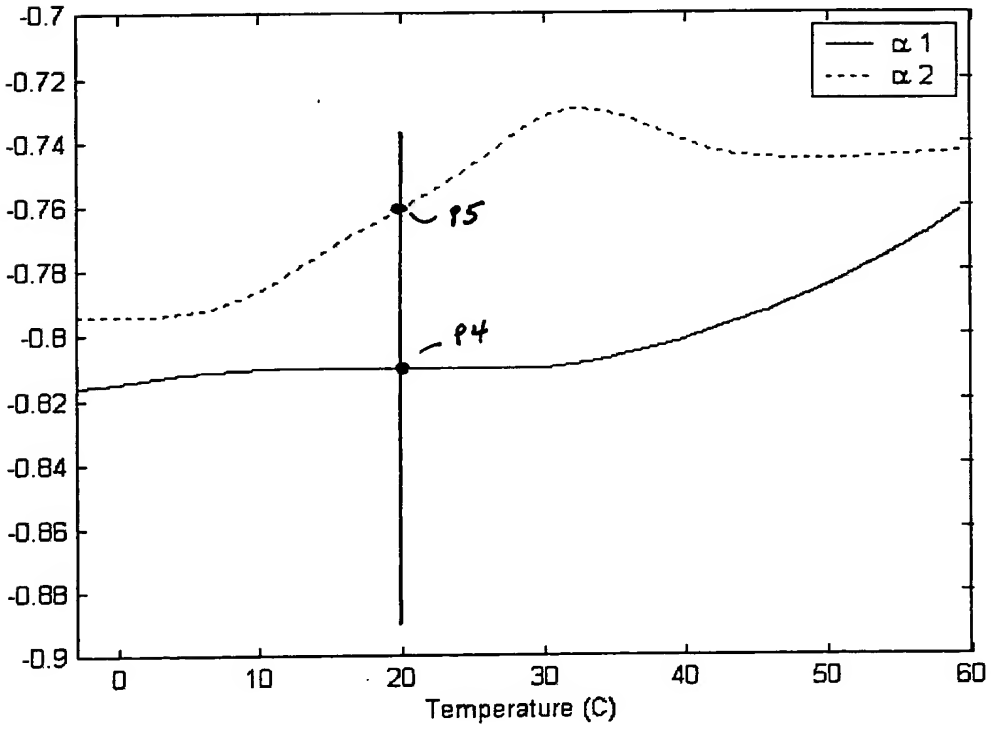
α 1
α 2
P5
P4
Temperature (C)
-0.7
-0.72
-0.74
-0.76
-0.78
-0.8
-0.82
-0.84
-0.86
-0.88
-0.9
0
10
20
30
40
50
60

FIG. 20

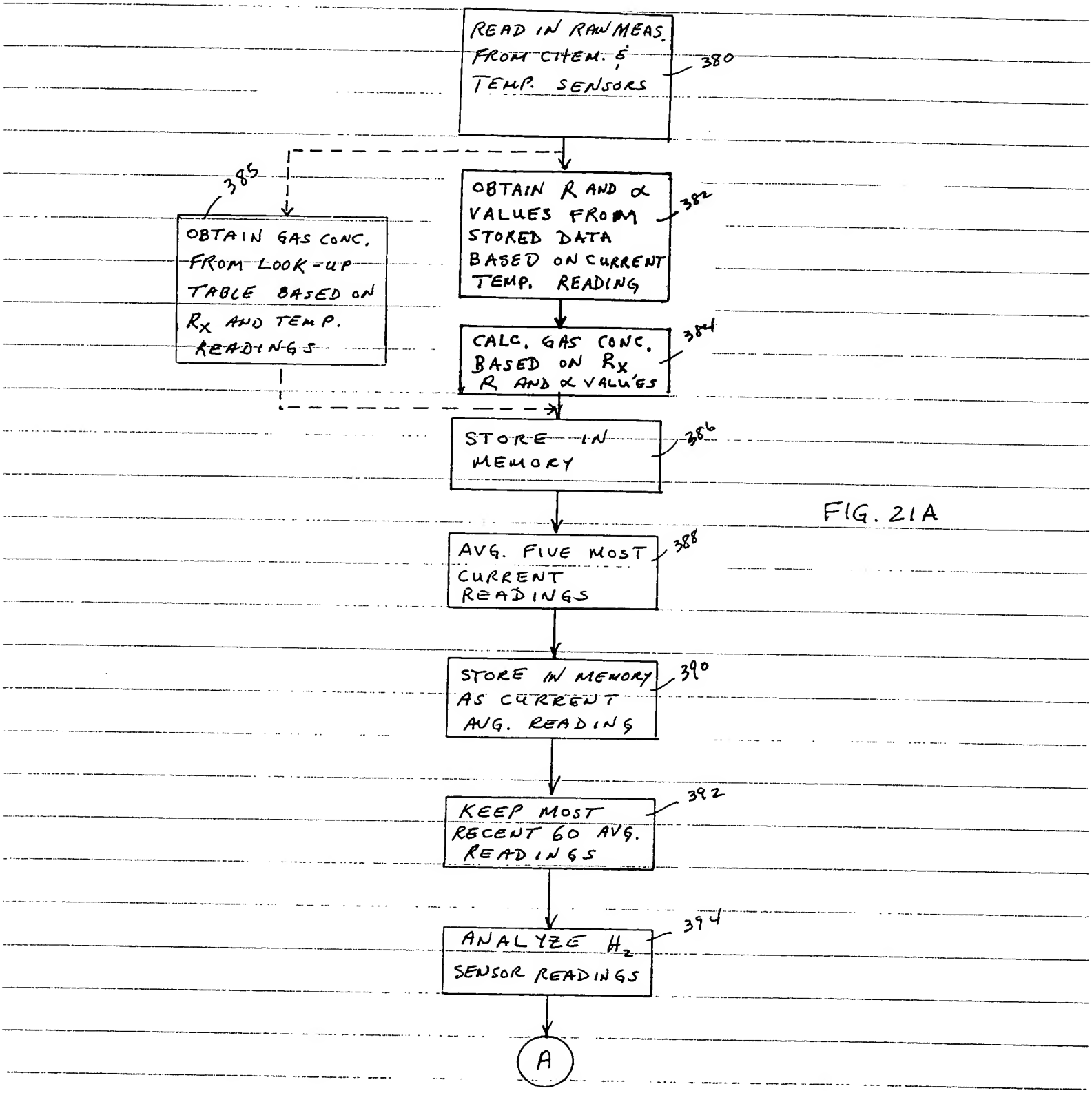
READ IN RAW MEAS. FROM CHEM. & TEMP. SENSORS
380
OBTAIN R AND α VALUES FROM STORED DATA BASED ON CURRENT TEMP. READING
382
CALC. GAS CONC. BASED ON Rx R AND α VALUES
384
385
OBTAIN GAS CONC. FROM LOOK-UP TABLE BASED ON Rx AND TEMP. READINGS
STORE IN MEMORY
386
AVG. FIVE MOST CURRENT READINGS
388
STORE IN MEMORY AS CURRENT AVG. READING
390
KEEP MOST RECENT 60 AVG. READINGS
392
ANALYZE H2 SENSOR READINGS
394
A

FIG. 21A

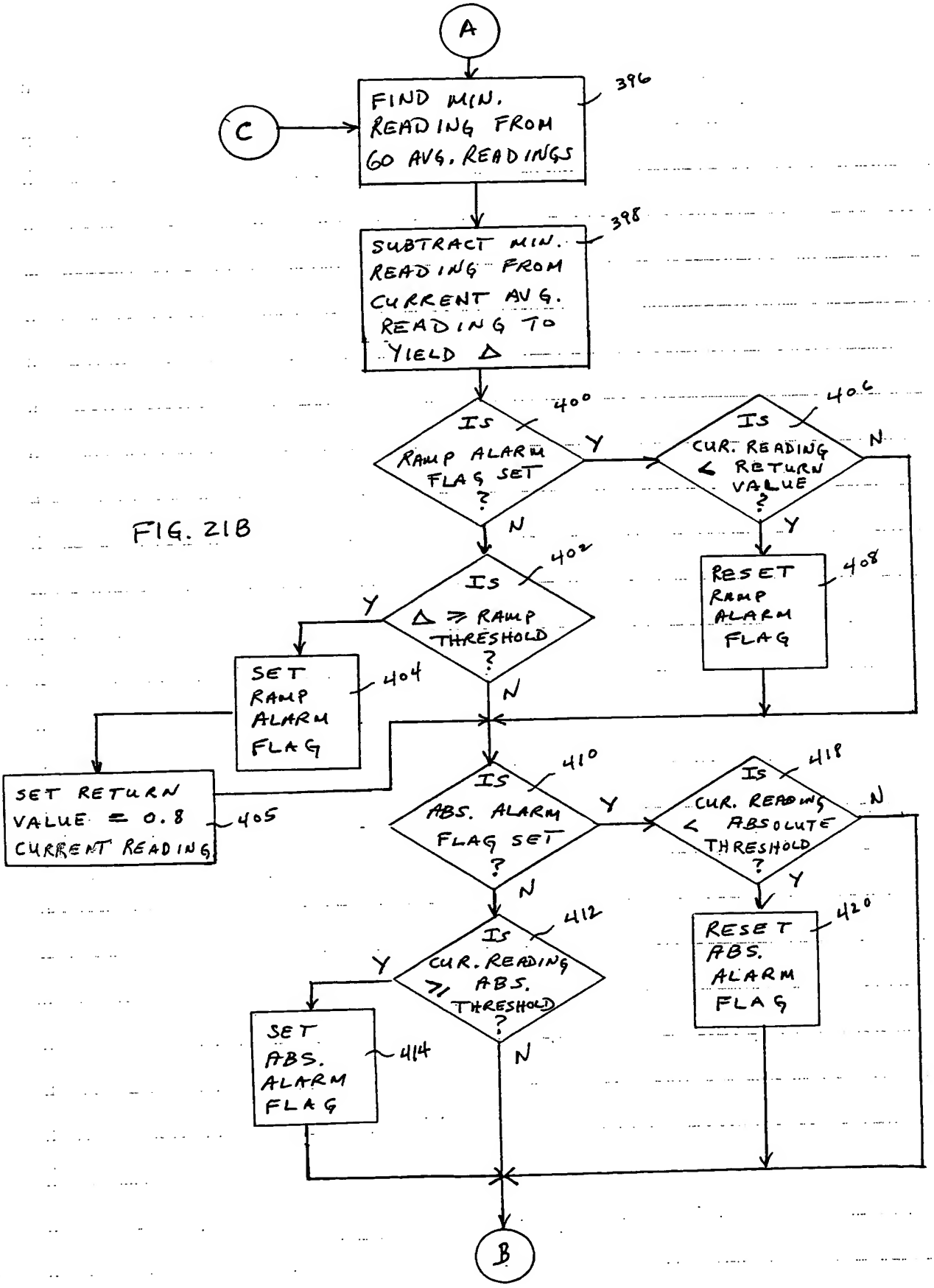
A
C
FIND MIN. READING FROM 60 AVG. READINGS
396
SUBTRACT MIN. READING FROM CURRENT AVG. READING TO YIELD Δ
398
IS RAMP ALARM FLAG SET ?
400
Y
N
IS CUR. READING < RETURN VALUE ?
406
N
Y
IS Δ ≥ RAMP THRESHOLD ?
402
Y
N
SET RAMP ALARM FLAG
404
RESET RAMP ALARM FLAG
408
SET RETURN VALUE = 0.8 CURRENT READING
405
IS ABS. ALARM FLAG SET ?
410
Y
N
IS CUR. READING < ABSOLUTE THRESHOLD ?
418
N
Y
IS CUR. READING ≥ ABS. THRESHOLD ?
412
Y
N
SET ABS. ALARM FLAG
414
RESET ABS. ALARM FLAG
420
B

FIG. 21B

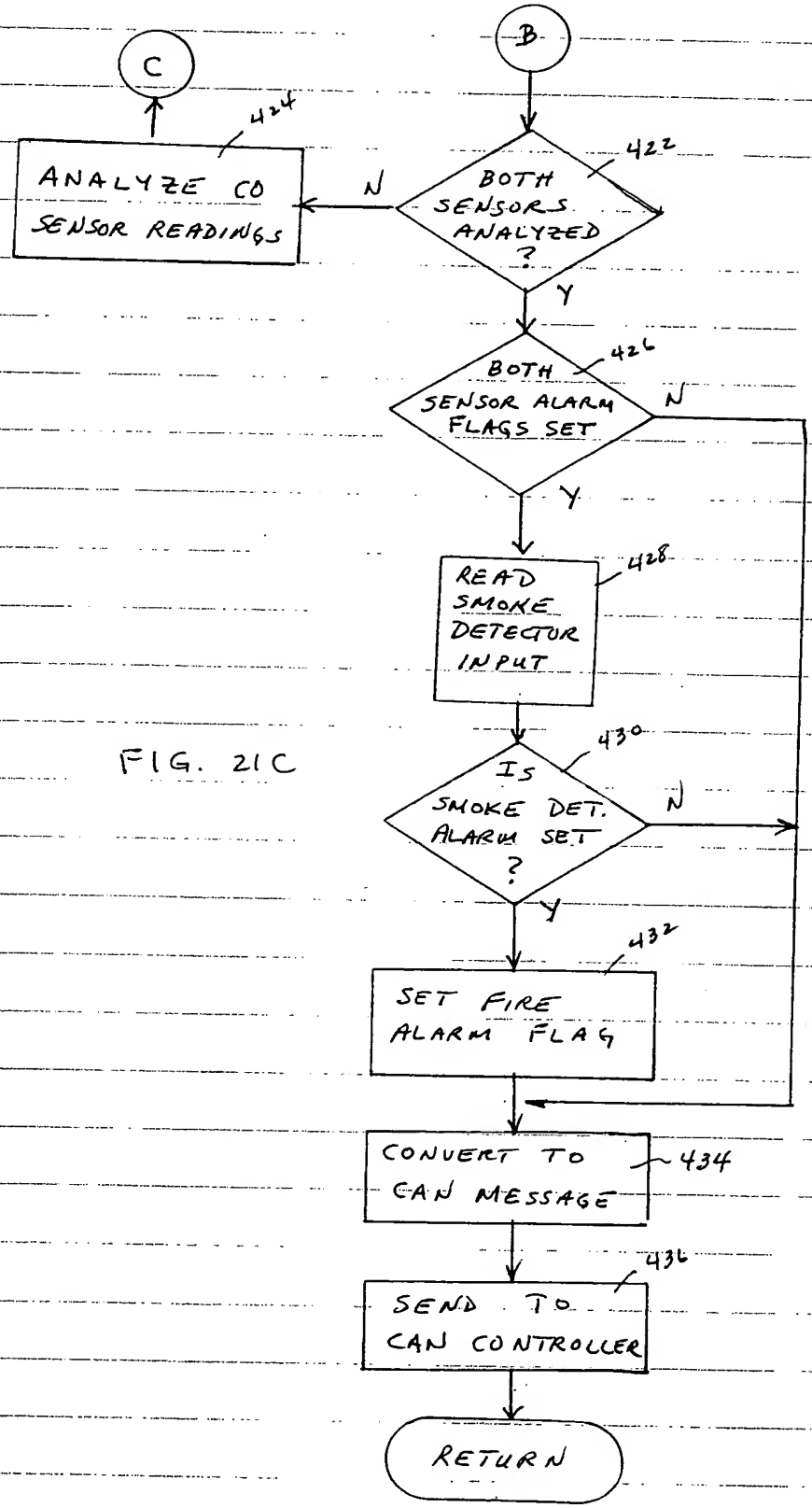
B
C
422
BOTH SENSORS ANALYZED ?
N
Y
424
ANALYZE CO SENSOR READINGS
426
BOTH SENSOR ALARM FLAGS SET
N
Y
428
READ SMOKE DETECTOR INPUT
430
IS SMOKE DET. ALARM SET ?
N
Y
432
SET FIRE ALARM FLAG
CONVERT TO CAN MESSAGE
434
436
SEND TO CAN CONTROLLER
RETURN

FIG. 21C

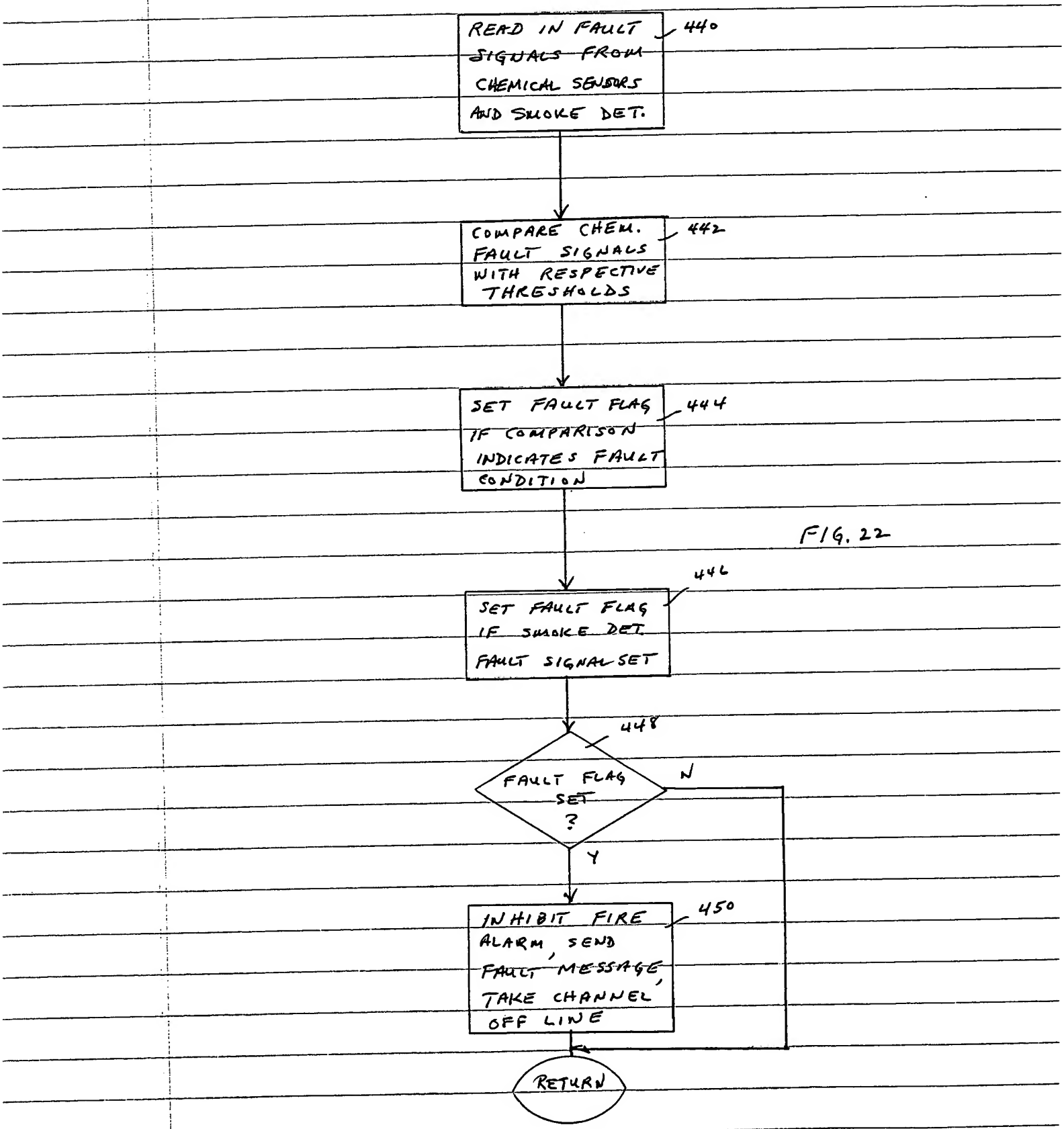
READ IN FAULT SIGNALS FROM CHEMICAL SENSORS AND SMOKE DET.
440
COMPARE CHEM. FAULT SIGNALS WITH RESPECTIVE THRESHOLDS
442
SET FAULT FLAG IF COMPARISON INDICATES FAULT CONDITION
444
SET FAULT FLAG IF SMOKE DET. FAULT SIGNAL SET
446
448
FAULT FLAG SET ?
N
Y
INHIBIT FIRE ALARM, SEND FAULT MESSAGE, TAKE CHANNEL OFF LINE
450
RETURN

FIG. 22